Using the RQ-11 Raven-A and the T-Hawk for Oversight Inspections of Surface Coal Mines in West Virginia

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Project Overview

- Background
- Timeline
- Data collected
- What we do with the data?
- How successful was it?
- Future Study

Why are we doing this?

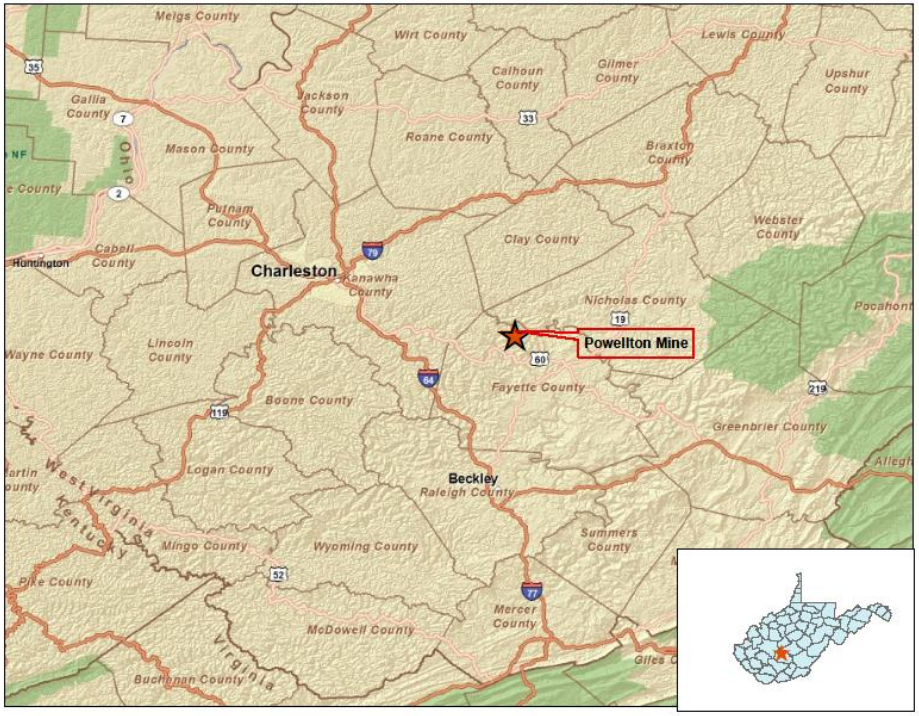
- Helicopter over-flights
- Satellite Imaging
- The U.S. Geological Survey coordination

2011
The RQ-11 Raven

Specifications:

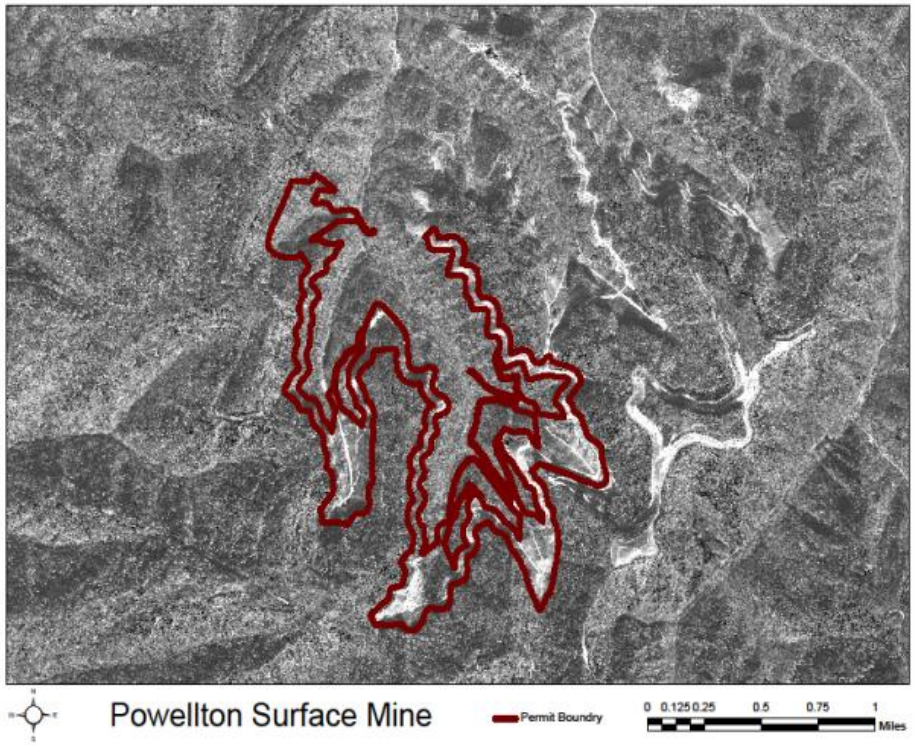
- Weight: 4.2 lbs
- Length: 3 ft 7 in.
- Wingspan: 4 ft 3 in.
- Cruising speed: 60 mph
- Range: 6.2 miles
- Flight time: 60-80 minutes
- Interchangeable payloads
- Cost : $35, 000

The Raven Methodology



- Site selection
- Must be a mine site
- Multiple on the ground features
- Underground mine fire

- The Bridge Fork West Surface Mine
- Fayette Co., WV
- Issued Jane 21, 2004
- 463.8 acre Contour strip mine
- Site mostly reclaimed



What did we get?

Optical and Thermal Video Images

The Raven Conclusions

- Image quality is sufficient.
- Multiple views
- Different cameras
- Inspector safety
- Historical record
- Time Savings

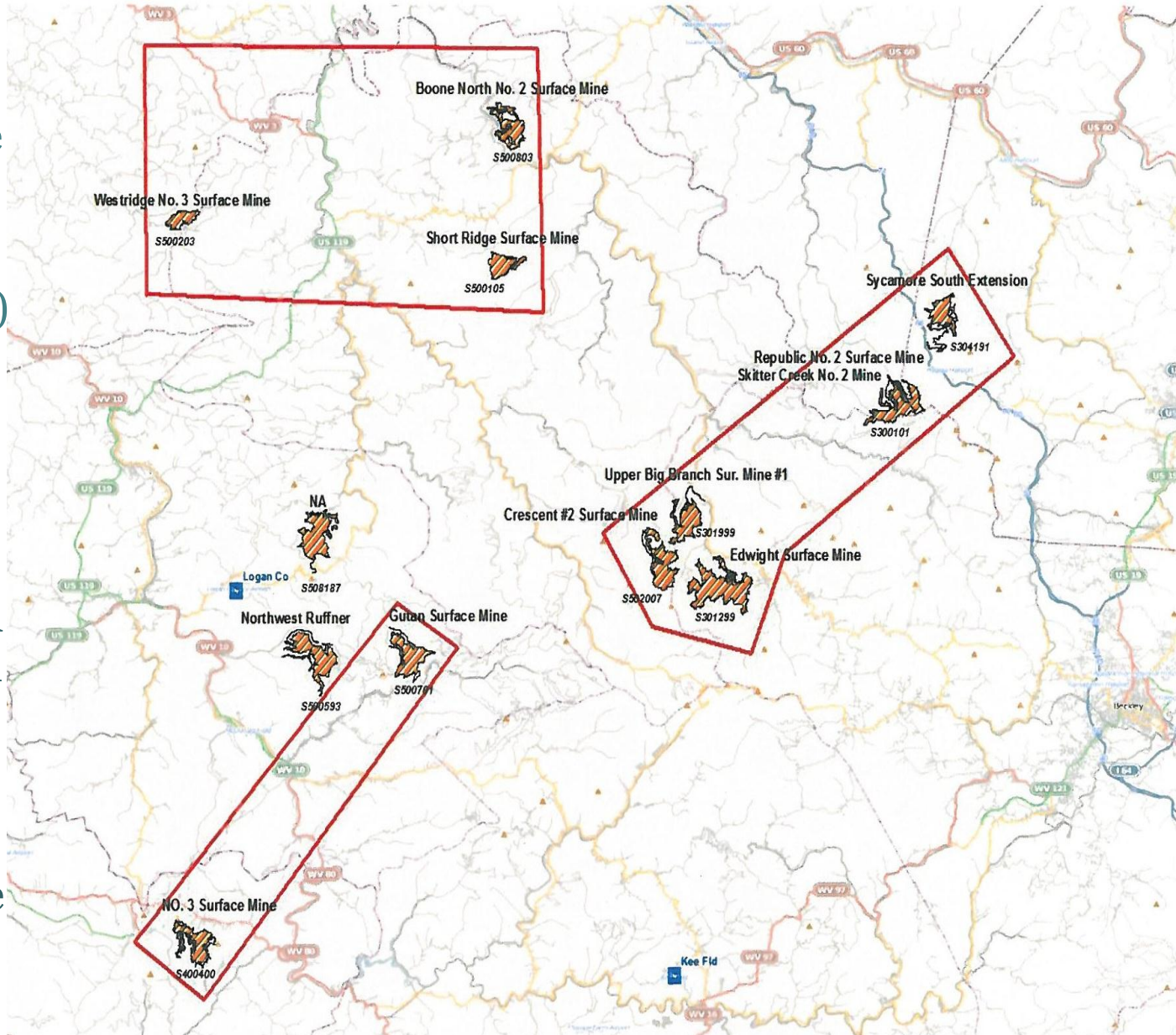
- Paperwork
- Personnel
- Visual line of Sight
- Data Duplication
- Aircraft Maneuverability
- No Scale

2012
The RQ-16A T-Hawk

- Micro Air Vehicle (MAV) with ducted fan
- Vertical Take Off and Landing
- Weight: 20 lbs
- Capable of up to 81 mph speed
- Flight time: 40 minutes
- One person operation
- Fuel : Aviation fuel
- Cost $500,000

T-Hawk Methodology

- The Plan
  - 15 randomly selected Mine sites with Raven and T-Hawk side by side (2 teams)
  - 3 days
  - Thermal and Optical data
- The Reality
  - 8 sites flown
  - Only 1 flown with Raven
  - 3 ½ days
  - Thermal camera not effective due to weather conditions



Results

Permit overview-Quick look

Drainage Control Inspection

Large Features

Adjustable Camera

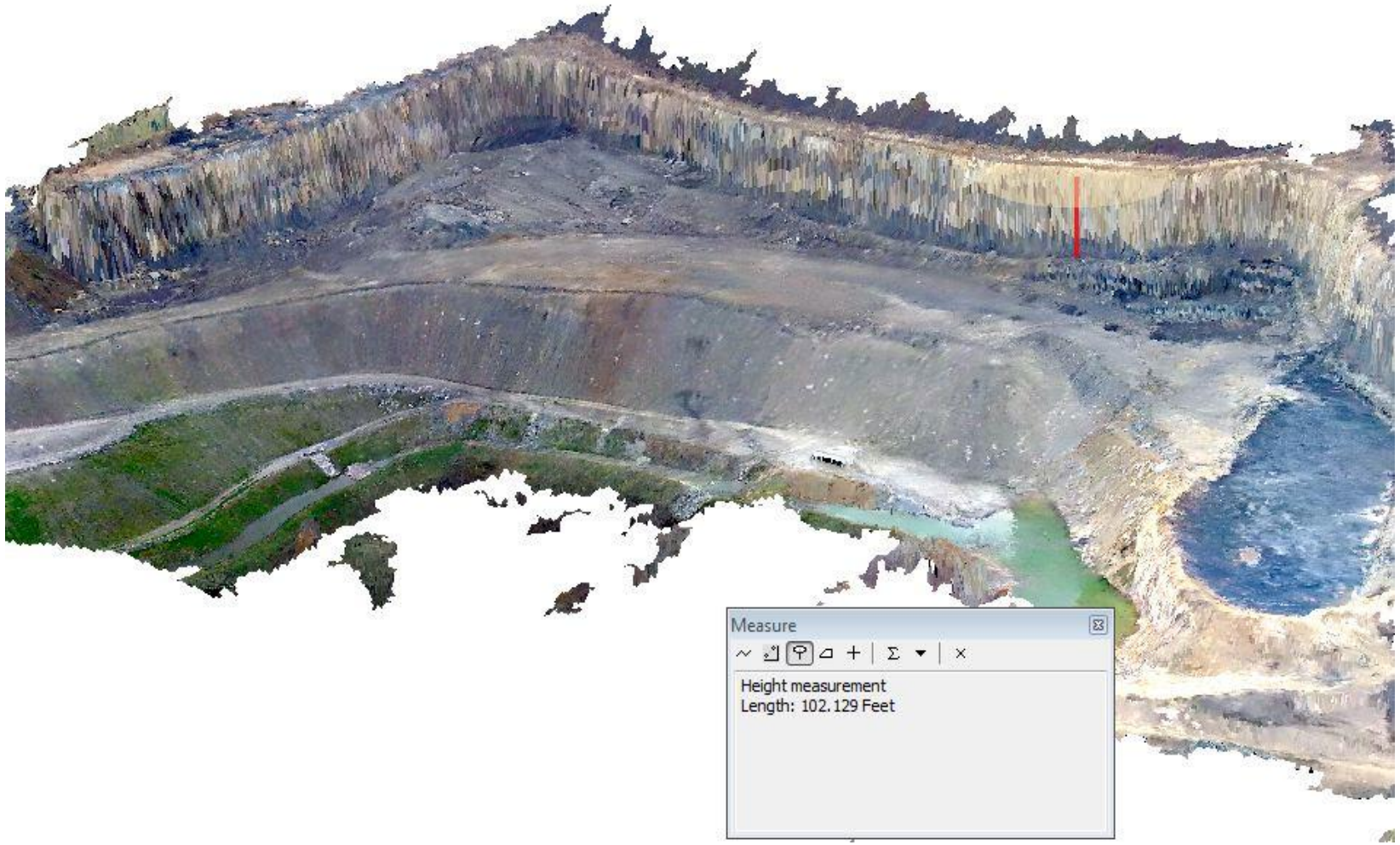
- Helps identify potential problem areas

Scale

- **Pond 1A- Spillway bottom**
  - **45’ measured**
  - **42.96’ certified**
  - **43’ calculated**
- **Top**
  - **65’ measured**
  - **66.10’ certified**
  - **69’ calculated**

- **Pond 1B- Spillway bottom**
  - **42’ measured**
  - **44.6’ certified**
  - **43’ calculated**
- **Top**
  - **65’ measured**
  - **67.5’ certified**
  - **65’ calculated**

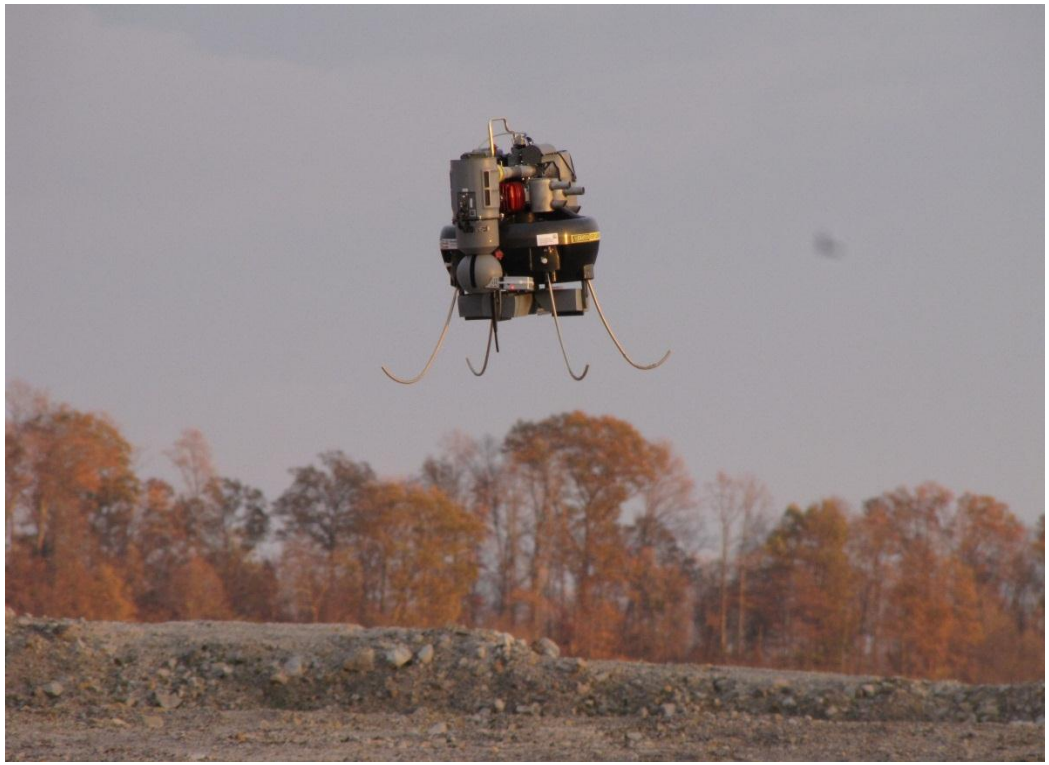
3D Models



Results

- 6500 acres flown
- 4 miles of drainage structures
- Average time per permit 50 minutes
- 90% of each permit inspected
- Improved Imagery Quality
- Time saving
- Increased safety

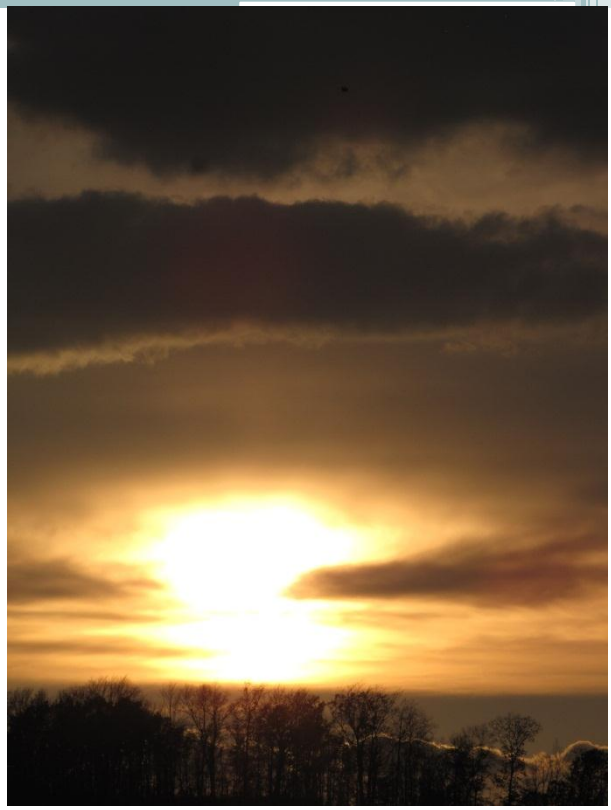
Results cont.



- Scale
- Maneuverability
- Inspector safety
- Historical record
- Time Savings
- Paperwork is still an issue
- Visual line of Site still applies
- Cost/Benefit Ratio is in the works
- Further study is needed
- No trained pilots in OSM to date


Questions?

Thank You For Your Attention!



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